ACCESSION #: 9605060201
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Kewaunee Nuclear Power Plant PAGE: 1 OF 9

DOCKET NUMBER: 05000305

TITLE: Two Reactor Trips Result from Turbine Control System
Check Valve Failure and Inadequate Control of Steam
Generator Inventory
EVENT DATE: 03/31/96 LER #: 96-002-00 REPORT DATE: 04/30/96

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: N POWER LEVEL: 70

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
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COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: JJ COMPONENT: ISV MANUFACTURER: W120
REPORTABLE NPRDS: N

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

This report describes two events which caused reactor protection system actuations. The first event occurred with the plant at 70 percent power on March 31, 1996. The actuation occurred during the performance of Special Test Procedure TB-54-1, "Turbine Reheat Stop Valve - Test and Trouble Shooting." A spring loaded piston check valve failed allowing the emergency trip fluid header to depressurize, which caused the turbine stop valves to close resulting in a reactor trip. The second event occurred on April 1, 1996, with the plant in the hot shutdown mode. The operating crew was performing Surveillance Procedure 49-074A, "Control Rod Drop Time Test - Startup Measurements," and mistakenly allowed Steam Generator level to decrease to the reactor protection actuation setpoint of 17 percent.

The cause of the first event was the failure of a spring loaded check

valve. The second event was caused by the operating crew failing to recognize the impact of changing plant conditions.

The spring loaded check valve was replaced and the reheat stop valve was successfully tested on April 1, 1996. Operations training will continue to stress the importance of recognizing and assessing the impact of changing plant conditions. A training module, incorporating operating experience, will be developed to address operation of the plant during the varying conditions that can exist following a reactor trip.

END OF ABSTRACT

DESCRIPTION OF EVENT

The following describes two events which resulted in the actuation of the reactor protection system [JD]. The first event resulted in a reactor trip [RCT] from an at power condition. The second event consisted of a reactor protection actuation in the hot shutdown (HSD) condition during control rod [AA] testing.

Event One

On March 31, 1996 the Kewaunee Nuclear Power Plant (KNPP) was operating at 70 percent power to perform Special Test Procedure (STP) TB-54-1, "Turbine Reheat Stop Valve - Test and Trouble Shooting." This procedure was being implemented to address the unsuccessful test of turbine reheat stop valve (RHSV)[ISV] 1B2 during the performance of Surveillance Procedure (SP) 54-086, "Turbine Stop and Governor Valve Operability Test," on March 17, 1996.

During the performance of SP 54-086, on March 17, 1996 a solenoid valve [TV] in the Electrohydraulic (EH) fluid drain line was believed to have failed, see figure 1. The solenoid valve in question is required to open when the test pushbutton is depressed in the control room. When the solenoid valve opens EH fluid is allowed to drain, closing RHSV 1B2.

STP-TB-54-1 required RHSV 1B2 to be cycled by draining EH fluid from underneath the valve positioning piston. For test purposes, there are two methods of draining the EH fluid supply from RHSV 1B2. The EH fluid can be drained by the Nuclear Control Operator (NCO) actuating the solenoid valve by depressing the test pushbutton in the control room, or EH fluid can be drained by locally opening an EH fluid dump valve [HCV].

When STP-TB-54-1 directed the NCO to depress the test pushbutton for RHSV 1B2, the valve did not change position. Personnel were stationed at the solenoid valve to take in-rush current and voltage data to ensure the solenoid valve was receiving an open signal. It was determined that the solenoid valve was receiving an open signal, but in-rush current was slightly lower than expected. In accordance with the STP, the solenoid coil was replaced and the pushbutton test was repeated. RHSV 1B2 still did not close. Continuing with the STP, personnel were directed to use the local EH fluid dump valve to close RHSV 1B2. The EH fluid dump valve was cracked open with no observed indication of RHSV 1B2 changing positioning. The EH fluid dump valve was opened incrementally and RHSV 1B2 moved to mid-position. The EH fluid dump valve was opened further with the expectation of RHSV 1B2 fully closing. When the EH fluid dump valve was opened the emergency trip fluid header depressurized causing RHSVs 1A1, 1A2,, 1B1,1B2 and Turbine Stop Valves (TSV)[ISV] MS-3A and MS-3B to go closed. The two TSVs closing caused a reactor trip.

After the reactor trip, Integrated Plant Emergency Operation Procedure (IPEOP), E-0, "REACTOR TRIP OR SAFETY INJECTION," was implemented. All plant systems responded as designed. After E-0 was performed the NCO identified one of the high steam flow status lights [IL] was illuminated. The Instrument and Control department was notified and the high steam flow bistable, associated with the status light, was recalibrated and returned to service on March 31, 1996.

Event Two

Due to the issuance of NRC Bulletin 96-01, "CONTROL ROD INSERTION PROBLEMS," it was determined by KNPP management that control rod drop tests would be performed while the reactor was in the Hot Shutdown Mode.

Control rod drop testing is performed in accordance with SP 49-074A, "Control Rod Drop Time Test - Startup Measurements." To perform the SP, the reactor trip breakers are closed to allow control rods to be withdrawn.

Instructions given during the 0600, operations shift turnover were to maintain Steam Generator (SG)[JB] levels between 4 and 50 percent in accordance with IPEOP ESO. 1, "REACTOR TRIP RESPONSE. Initially SG levels were being maintained constant at approximately 35 percent using one Auxiliary Feedwater (AFW)[BA] pump. It was later decided to conserve condensate storage tank (CST)[KA] inventory by batch feeding the SGs to approximately 55 percent and then allowing level to decrease to

approximately 10 percent and then refilling them to 55 percent. The first batch feed was performed using the AFW pump and subsequent batch feeding would be done using a main feedwater pump [P].

Prior to performing the SP 49-074A, the SGs were filled to approximately 55 percent and the operating crew participated in an Infrequently Performed Tests and Evolutions briefing. During the performance of the procedure, the crew discussed the consequences of a control rod or multiple control rods not fully inserting during the test. The NCO controlling SG levels was also supporting various activities in preparation for the reactor startup planned for later that day. While rod drop testing was in progress the crew noticed SG B level at approximately 20 percent and SG A level less than 20 percent and decreasing. At this time the crew recognized that a reactor protection signal would be generated at 17 percent SG level. The NCO started the A train AFW pump and opened the discharge valve [FCV]. As the NCO opened the discharge valve the reactor protection signal was generated.

When the reactor protection signal was generated the control rods being tested at the time fell into the reactor core and IPEOP E-0 was implemented. All plant system responded as designed.

CAUSE OF EVENT

Event 1

It was determined that the root cause of the depressurization of the emergency trip fluid header was the failure of a spring loaded piston check valve upstream of the RHSV 1B2 in the emergency trip fluid header. This check valve is designed to keep the emergency trip fluid header pressurized when RHSV 1B2 is tested. This design is common to the RHSVs, the Intercept Valves (IVs), and the TSVs.

Event 2

The root cause of the low low SG level Trip was determined to be the crew not recognizing that, in the plant condition that existed at the time, the low low level of 17 percent narrow range level would generate a reactor protection signal. The alignment of the reactor protection system changed during the course of the operations shift, and the crew did not effectively adapt to these changes.

In addition to this root cause there were several contributing factors identified during this event investigation. They include, performing SP

49-074A at an unfamiliar time of plant operation, the decision to conserve CST level by batch feeding the SGs, and the NCO performing multiple tasks in preparation for the reactor startup planned later in the day.

ANALYSIS OF EVENT

Event 1

The turbine trip initiating a reactor trip is reportable in accordance with 10CFR50.73(a)(2)(iv) as an event that resulted in the actuation of the reactor protection system. This event was also reported in accordance with 10CFR50.72 (b)(2)(ii), at 0455 CST, on March 31, 1996.

The reactor trip occurred due to two out of two Turbine Stop valves closed which generates a reactor if trip signal. IPEOP E-0, "REACTOR TRIP OR SAFETY INJECTION, was implemented and all plant systems responded as designed. Since all systems functioned as designed and nothing unusual or not understood occurred, this event had no safety significance.

Event 2

The decrease in SG level to the reactor protection signal setpoint event is reportable in accordance with 10CFR50.73 (a)(2)(iv) as an event that resulted in the actuation of the reactor protection system. This event was also reported in accordance with 10CFR50.72(b)(2)(ii), at 1226 CST, on March 31, 1996.

The generation of the reactor protection signal occurred due to the operating shift allowing SG 1A level it to decrease to the SG low low setpoint. IPEOP E-0, "REACTOR TRIP OR SAFETY INJECTION, was implemented and all plant systems responded as designed. Since all systems functioned as designed and nothing unusual or not understood occurred, this event had no safety significance.

CORRECTIVE ACTIONS

The following corrective actions have been or will be performed.

Event 1

The spring loaded check valve which allowed the emergency trip fluid

header to depressurize and caused a reactor trip was replaced. RHSV 1B2 was tested operable by performing partial SP 54-086, "Turbine Stop and Governor Valve Operability Test," on April 1, 1996. The cause of the spring loaded check valve failure will be evaluated.

The RHSVs, the IVs, and TSVs with the same design as RHSV 1B2 were tested operable on March 17, 1996 when SP 54-086 was originally performed.

Event 2

Operations Requalification training continues to stress maintaining an awareness of changing plant conditions and to provide guidance on the role of each team member of the operating crew. This event reinforced the importance of recognizing and assessing the impact of changing plant conditions and operating crew teamwork.

A training module is being developed which will focus on startup evolutions and the varying conditions that can exist after a reactor trip. The training module will address the root cause of this event and its contributing factors and use past Kewaunee operating experience and lessons learned. The training module is planned to be used in the next operations requalification cycle which starts in September of 1996.

ADDITIONAL INFORMATION

Equipment Failures: Spring loaded piston check valve in the 1B2 RHSV EH fluid test piping.

Similar Events: LER 88-012, "Inadvertent Actuation of ESF Equipment During Plant Startup Due to Failure to Maintain Steam Generator Level Below Hi-Hi Setpoint While in Manual Control."

LER 89-016, "Closure of Turbine Stop Valves Causes a Turbine/Reactor Trip."

LER 93-012, "Unplanned Automatic Letdown Isolation Occurred During a Plant Cooldown Due to Inadequate Control of Pressurizer Level."

LER 93-013, "Actuation of Both Motor Driven Auxiliary Feedwater Pumps Due to Regulating Valves Failing to Completely Close and Subsequent Operator Action.

FIGURE 1 omitted.

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April 30, 1996 10 CFR 50.73

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Ladies/Gentlemen:

Docket 50-305
Operating License DPR-43
Kewaunee Nuclear Power Plant
Reportable Occurrence 96-002-00

In accordance with the requirements of 10 CFR 50.73, "Licensee Event Report System," the attached Licensee Event Report (LER) for reportable occurrence 96-002-00 is being submitted.

Sincerely,

M. L. Marchi
Manager - Nuclear Business Group

JDD/jmf

Attach.

cc - INPO Records Center
US NRC Senior Resident Inspector
US NRC, Region III

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